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Co-Lead Class Counsel

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN JOSE DIVISION

IN RE: HIGH-TECH EMPLOYEE
ANTITRUST LITIGATION

THIS DOCUMENT RELATES TO:

ALL ACTIONS

Master Docket No. 11-CV-2509-LHK

**OPPOSITION TO DEFENDANTS'
MOTION TO EXCLUDE TESTIMONY
OF EDWARD E. LEAMER, PH.D.**

Date: March 20 and 27, 2014
Time: 1:30 pm
Courtroom: 8, 4th Floor
Judge: Honorable Lucy H. Koh

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¹ The deposition of witnesses who provided a report and a deposition are abbreviated as "[Last Name] Dep."; the deposition of witnesses who provided a deposition but not a report are abbreviated as "[Last Name]." Deposition transcripts and exhibits are attached to the accompanying Declaration of Lisa J. Cisneros In Support of Plaintiffs' Opposition Briefs. All other documents are attached to the accompanying Declaration of Dean M. Harvey In Support of Plaintiffs' Opposition Briefs.

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Merits Expert Report of Lauren Stiroh (November 25, 2013) Stiroh ¶ ____

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INTRODUCTION

Defendants have moved to exclude one part of Dr. Leamer's testimony: his damages estimate. Dkt. 570. The motion should be denied.

LEGAL STANDARD AND THE COURT'S PRIOR RULINGS

In applying Federal Rule of Evidence 702 and *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993), courts should apply a "liberal standard" for the admission of expert testimony. *United States v. Gomez*, 67 F.3d 1515, 1526 (10th Cir. 1995). Indeed, in *Daubert* the Supreme Court recognized that the purpose of Rule 702 was to *reduce* barriers to the admission of scientific testimony. 509 U.S. at 588 (discussing the "liberal thrust of the Federal Rules and their general approach of relaxing the traditional barriers to 'opinion' testimony" (quotation marks omitted)). *Daubert*

cautions lower courts not to confuse the role of judge and jury by forgetting that "vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof," rather than exclusion, "are the traditional and appropriate means of attacking shaky but admissible evidence."

United States v. Chischilly, 30 F.3d 1144, 1154 (9th Cir. 1994) (quoting *Daubert*). "Only if the expert's opinion is so fundamentally unsupported that it can offer no assistance to the jury must such testimony be excluded." *Hartley v. Dillard's, Inc.*, 310 F.3d 1054, 1061 (8th Cir. 2002). Because of this liberal standard, courts rarely exclude expert testimony. See Adv. Cmt. Notes to 2000 Am. to Fed. R. Evid. 702 ("A review of the caselaw after *Daubert* shows that the rejection of expert testimony is the exception rather than the rule."). "In arriving at a conclusion, the factfinder may be confronted with opposing experts, additional tests, experiments, and publications, all of which may increase or lessen the value of the expert's testimony. But their presence should not preclude the admission of the expert's testimony—they go to the *weight*, not the admissibility." *Kennedy v. Collagen Corp.*, 161 F.3d 1226, 1230-31 (9th Cir. 1998).

The Supreme Court's *Bazemore v. Friday*, 478 U.S. 385 (1986) (per curiam), decision sets out the rules for evaluating regression analysis. The plaintiffs in *Bazemore* were black employees challenging their employer's use of a discriminatory pay system that paid blacks less than whites. The appellate court found the regression analyses of salary differences between whites and blacks

1 to be “unacceptable as evidence of discrimination” because the analyses had failed to include “all
 2 measurable variables” thought to effect salary. *Id.* at 399-400. In reversing, Justice Brennan, in a
 3 concurrence joined by every member of the Court, stated that as long as a regression includes
 4 variables accounting for the “major factors” bearing on it, lesser quarrels will go to “the analysis’
 5 probativeness, not its admissibility.” *Id.* at 400.

6 This Court has already evaluated Dr. Leamer’s regression model—twice, in fact. *See*
 7 April 5, 2013 Order, Dkt. 382; October 24, 2013 Order, Dkt. 531; Leamer Merits ¶ 32 (explaining
 8 minor changes to data in October 1, 2012, model). In its April 5, 2013 Class Certification Order,
 9 the Court assessed Dr. Leamer’s “Conduct Regression” model for the purpose of demonstrating
 10 classwide damages, and held that “Conduct Regression provides a reasonable method of . . .
 11 quantifying the amount by which Defendants’ expenditures were reduced (*i.e.*, providing a
 12 measure of class-wide damages to the Class).” Dkt. 382 at 35; *see also* Dkt. 382 at 44 (“Dr.
 13 Leamer also demonstrates a model that estimates class-wide damages for members of the
 14 alternative Technical Class.”). In denying the Defendants’ similar motion to strike Dr. Leamer’s
 15 expert report and his model, the Court concluded that the Defendants’ criticisms should be
 16 reserved for the jury because “this evidence is of the type to be attacked by cross examination,
 17 contrary evidence, and attention to the burden of proof” and did not “warrant exclusion.” *Id.* at
 18 50 (quotation marks omitted). The Court reaffirmed this conclusion concerning the admissibility
 19 of Dr. Leamer’s regression model in its October 24, 2013 Class Certification Order (Dkt. 531):
 20 “Because Dr. Leamer’s model is supported by the economic literature (including Dr. Shaw’s), is
 21 statistically robust (*i.e.*, insensitive to alternative control variables), and is buttressed by Dr.
 22 Leamer’s subsequent analysis, the Court finds that Dr. Leamer’s model is capable of calculating
 23 classwide damages.” *Id.* at 82. The Court considered and rejected Defendants’ argument that the
 24 regression must produce statistical significance at 95% levels: “the fact that when the errors were
 25 clustered, the Conduct Regression’s results were not statistically significant at the 95 percent
 26 confidence level did not persuade the Court that the regression was unpersuasive.” *Id.* at 81.

27 In doing so, this Court applied the *higher* “rigorous analysis” standard required at the class
 28 certification stage. *See, e.g., Ellis v. Costco Wholesale Corp.*, 657 F.3d 970, 982 (9th Cir. 2011);

1 *see also Pedroza v. PetSmart, Inc.*, No. ED CV 11-298-GHK, 2013 U.S. Dist. LEXIS 53794, at
 2 *10 (C.D. Cal. Jan. 28, 2013) (“Inasmuch [sic] the ‘rigorous analysis’ standard sets forth a higher
 3 standard than *Daubert*, it appears that under *Ellis*, we are required to engaged [sic] in *Daubert*
 4 analysis to the extent the testimony concerns a Rule 23 requirement.”). There is a consequence to
 5 demanding that courts considering class certification find that scientific evidence satisfies a
 6 higher standard than *Daubert*. Dkt. 209 at 10-11 (demanding “convincing proof,” that the Court
 7 “consider the merits” and “resolve the critical factual disputes”). The consequence is that, as here,
 8 there will not be any basis for a further *Daubert* motion down the road on the same evidence.

9 ARGUMENT

10 I. Statistical Significance

11 Defendants contend that a regression model must reject a point null hypothesis of zero
 12 effect at a minimum 95% level of statistical significance in order to be reliable evidence of impact
 13 and damages. Dkt. 570 at 5. What this means is that the inherent variability in the data must be
 14 such that if there are no true damages it will only mistakenly find an effect other than zero one in
 15 twenty times (Type I error). They say Professor Leamer has endorsed this requirement himself.
 16 *Id.* at 7. They say that a 50% level of statistical significance, which balances the risk of
 17 mistakenly rejecting the null hypothesis with the risk of mistakenly accepting it (Type II error),
 18 would be “junk science” and amount to using random chance to determine “billions of dollars in
 19 damages”. Dkt. 570 at 8-9.

20 As explained below, each of these assertions is false. First, Defendants misrepresent the
 21 scientific literature. There is no authority requiring that in every case a regression must reject a
 22 null hypothesis of zero at a 95% level to be reliable. In fact, the weight of statistical authority
 23 holds mechanical use of point null hypothesis testing in low regard. *See Cook v. Rockwell Int’l.*
 24 *Corp.*, 580 F. Supp. 2d 1071, 1102 (D. Colo. 2006) (“there is a considerable dispute in the
 25 scientific community about the necessity or even relevance of statistical significance testing”).
 26 That is why none of Defendants’ statistical experts point to any such authority; indeed, Dr.
 27 Murphy admits that no such requirement exists.
 28

Second, in discussing Professor Leamer's prior work, Defendants confuse statistical significance with point null hypothesis testing. As Professor Leamer has explained in deposition, "statistical significance" refers to the larger concept of statistical measurability. "Point null hypothesis testing" refers to a more limited concept: using a particular level of statistical significance (measurability) to "reject" a hypothesis of zero effect. Contrary to Defendants' assertions, Dkt. 570 at 5, Professor Leamer has never once advocated the use of point null hypothesis testing as Defendants describe it, in this case, in any case, or in his own research.

Third, Defendants are again wrong to suggest that Professor Leamer has suggested flipping a coin to determine damages. Dr. Leamer's explanation that Type I and Type II error rates must be considered when utilizing a significance level in a point null hypothesis test is supported by peer-reviewed academic literature, including his own 1978 book *Specification Searches*. "Flipping a coin" refers to the fact that the 50% significance level has no bias in favor of either party (i.e., the chance of an error favoring either party is balanced and equal), not to randomness. On the other hand, the 95% level preferred by Dr. Stiroh is biased in favor of the Defendants because it would mistakenly *reject* a finding of low damages 95% of the time.

A. Hypothesis Testing is a Tool, Not a Requirement

To begin with, neither Defendants nor Dr. Stiroh have cited any authority for the proposition that a statistical analysis must reject a null hypothesis of zero effect at a specific level to be "consistent with standard economic practice," Dkt. 574, Decl. of Lauren J. Stiroh, Ph.D. in Support of Defs.' Joint Motion to Exclude the Expert Testimony of Edward E. Leamer, ¶ 5, or "standard practice for published and peer-reviewed economic literature," *Id.* ¶ 6, or to in general be reliable. To the contrary, "Significance testing is an important part of statistical theory and practice, but it is only one part, and there are other important ones." Kruskal, Wm., "Significance, Tests of," INT'L ENCYCLOPEDIA OF STATISTICS (1978), at 955 (Harvey Decl. Ex. 20.)

In fact, the weight of statistical literature holds that hypothesis testing must be done selectively, if at all, and the correct null hypothesis and required significance level must be chosen carefully in advance based on consideration of the facts, rather than set by "habit."

1 Consider the following advice from Ronald Fisher—who *invented* the very approach to
2 hypothesis testing on which Defendants and Dr. Stiroh rely:

3 However, the calculation [at the 1% level] is absurdly academic,
4 **for in fact no scientific worker has a fixed level of significance**
5 **at which from year to year, and in all circumstances, he rejects**
6 **hypotheses;** he rather gives his mind to each particular case in the
7 light of his evidence and his ideas. **It should not be forgotten that**
8 **the cases chosen for applying a test are manifestly a highly**
9 **selected set,** and that the conditions of selection cannot be specified
10 even for a single worker; nor that in the argument used **it would**
11 **clearly be illegitimate for one to choose the actual level of**
12 **significance indicated by a particular trial as though it were his**
13 **lifelong habit to use just this level.**

9 Fisher, R.A., *Statistical Methods and Scientific Inference* (3d. ed. 1973), 44-45 (emphasis added)
10 (Harvey Decl. Ex. 17). Fisher thus makes two points: first, that significance levels should not be
11 assumed out of habit or convention, and, second, that hypothesis testing must be used selectively.
12 Fisher further advises that the usefulness of the whole exercise must be considered in light of the
13 plausibility that the null hypothesis—according to Defendants, absolutely zero effect—is true in
14 the first place.

15 Further the calculation is based solely on a hypothesis, which, in the
16 light of the evidence, is often not believed to be true at all, so that
17 the actual probability of erroneous decision, supposing such a
18 phrase to have any meaning, may be, for this reason only, much less
19 than the frequency specifying the level of significance.

18 *Id.* at 45. Thus, before using point null hypothesis testing, the honest researcher must first
19 establish that a null hypothesis of exactly no effect is worthy of consideration, and then carefully
20 select the significance level in a way that is sensitive to the risk of Type II error.

21 During class certification, Defense expert Dr. Kevin Murphy agreed that statistical
22 significance at conventional levels is by no means a requirement for reliability of a model:

23 Q. Is that [significance at 5 percent level] a requirement of
24 economic analysis?

25 A. **No, it's not a firm requirement.** I'm just saying, you
26 know, that's the conventional level that people use.

26 Q. Okay. Is that – if I wanted to sort of look that up
27 somewhere, would I be able to look it up anywhere?

28 A. Yeah. Probably econometric textbook [sic] would talk
about that. But generally people talk about significance at various

1 levels of significance. ... I'm just telling you the common
 2 shorthand in economics is 5 percent, just talking about statistically
 significant with no modifier.

3 Murphy Dep. 364:10-23 (emphasis added). And again:

4 Q. Is it your opinion that in order for a statistical analysis to be
 5 reliable it must produce a statistically significant result?

6 A. **Not necessarily. That doesn't have to be true.**

7 Murphy Dep. 366:14-17 (emphasis added).

8 Dr. Stiroh and Defendants now take the opposite position but offer no support for it. At
 9 her deposition, Dr. Stiroh referred generally to "econometrics textbooks" but could not identify a
 10 single one that specifically endorses such a requirement. Stiroh Dep. 182:15-183:22. In fact, her
 11 sources say the opposite. For example, Dr. Stiroh cites and relies on the econometric textbook of
 12 Professor Peter Kennedy, *A Guide to Econometrics*, Sixth Edition (Blackwell Publishing, 2008).
 13 Stiroh Report at pp. 60, 61 (citing Kennedy). She describes it as "clearly written" and one that
 14 she cites "frequently." Stiroh Dep. 169:6-12. At deposition, Dr. Stiroh even relied on Dr.
 15 Kennedy and his "ten commandments" of econometric analysis to support her views. *Id.* 110:7-
 16 10 ("I think he's got ten commandments[.]"). Dr. Stiroh has apparently forgotten some of the
 17 later commandments, found in Chapter 22 of that same book.

18 PETER KENNEDY'S TEN COMMANDMENTS

19 THOU SHALT:

- 20 1. USE COMMON SENSE AND ECONOMIC THEORY
- 21 2. ASK THE RIGHT QUESTION
- 22 3. KNOW THE CONTEXT
- 23 4. INSPECT THE DATA
- 24 5. NOT WORSHIP COMPLEXITY
- 25 6. LOOK LONG AND HARD AT THY RESULTS
- 26 7. BEWARE THE COSTS OF DATA MINING
- 27 8. BE WILLING TO COMPROMISE
- 28 9. NOT CONFUSE STATISTICAL SIGNIFICANCE
WITH SUBSTANCE
10. CONFESS IN THE PRESENCE OF SENSITIVITY

1 Garcia-Ferrer, Antonio, “Peter Kennedy May 18, 1943 – August 30, 2010: A Tribute”
 2 (highlighting added) (Harvey Decl. Ex. 18).² In his textbook, Professor Kennedy calls hypothesis
 3 testing “misleading” and “overstated, overused and practically useless”:

4 For a number of reasons, tests of significance can sometimes be
 5 misleading...

6 Loftus’s (1993, p. 250) opinion that “hypothesis testing is
 7 overstated overused and practically useless as a means of
 8 illuminating what the data in some experiment are trying to tell
 9 us,” is shared by many.

10 Kennedy (2008), pp. 60, 61 (Harvey Decl. Ex. 19). Kennedy also says of the 95% threshold:

11 [T]here is no good reason why 5% should be preferred to some
 12 other percentage. The father of statistics, R.A. Fisher, suggested it
 13 in an obscure 1923 paper, and it has been blindly followed ever
 14 since.

15 *Id.* at 60.

16 In sum, Dr. Stiroh and the Defendants have no support for their view that a regression
 17 must reject a null hypothesis of zero impact at 95% levels in order to be reliable and admissible
 18 evidence, and the weight of authority in the field contradicts that position. *See Cook*, 580 F.
 19 Supp. 2d at 1103 (“Defendants’ assertion that an epidemiological study must produce
 20 ‘statistically significant’ results to satisfy the ‘reliability’ prong of Rule 702 is thus contrary to
 21 some of the evolving views in this field of science and provides no basis for excluding Dr.
 22 Clapp’s testimony.”) (collecting authority).³

23 ² Professor Kennedy died in 2010. This version of his Ten Commandments of Applied
 24 Econometrics appears in the tribute to him written by Professor Antonio Garcia-Ferrer of the
 25 University of Madrid. Professor Garcia-Ferrer also observed that Kennedy’s “‘Commandments’
 26 are deeply rooted in Edward Leamer’s work *Specification Searches*[.]” *Id.* Professor Kennedy
 27 acknowledged this in his book. Kennedy (2008), p. 361 (Harvey Decl. Ex. 19).

28 ³ Defendants cite *In re Silicone Gel Breast Implants Prods. Liab. Litig.*, 318 F. Supp. 2d 879,
 897-98 (C.D. Cal. 2004); *Henricksen v. ConocoPhillips Co.*, 605 F. Supp. 2d 1142, 1168 (E.D.
 Wash. 2009). Neither case mentions point null hypothesis testing; in both cases the studies in
 question had small sample sizes and large margins of error. For instance, in the *Silicone Gel
 Breast Implants* case the study suggested that the effect of the implant might range from
decreasing the risk of breast cancer by 50% to *increasing* it by 800%. 318 F. Supp. at 897. Both
 cases reinforce that there is no one hard rule governing acceptability of a particular statistical
 analysis. Judge Breyer in *Bextra & Celebrex* did not admit a particular study “because” it
 produced a “statistically significant” result, Dkt. 570 at 7; he considered the study as a whole. *In
 re Bextra & Celebrex Mktg. Sales Practices & Prod. Liab. Litig.*, 524 F. Supp. 2d 1166, 1181
 (N.D. Cal. 2007).

1 **B. Dr. Leamer Has Never Used Point Null Hypothesis Testing in this Case**

2 Defendants claim that Dr. Leamer has relied on point null hypothesis testing because he
3 previously reported the statistical significance of different variables. Nothing could be further
4 from the truth: Dr. Leamer has been clear since his very first deposition that he views null
5 hypothesis testing here at “conventional” levels as an unhelpful and indeed misleading exercise.
6 In October, 2012, he described F-tests, a form of null hypothesis testing, as “a silly econometric
7 enterprise.” Leamer Dep. 269:20-270:3. He said:

8 [D]etermining the significance of an effect is a completely
9 mechanical exercise. And when it doesn’t speak to the problem,
 it’s not something that we should rely on.

10 *Id.* 289:20-24. Or, as he put it more recently, Dr. Leamer does not use point null hypothesis
11 testing in any of his work, in this case or elsewhere.

12 I don’t do hypothesis testing. Most of my work is about estimation.
13 And in economics, the idea of exact zero values is extremely
 implausible. So the strict hypothesis testing isn’t something that
 enters my day-to-day statistical analysis.

14 *Id.* 1260:23-1261:4. Indeed, Dr. Leamer has been consistent in his professional and academic
15 views of hypothesis testing for 35 years. In his 1978 book, *Specification Searches: Ad Hoc*
16 *Inference With Non-Experimental Data*, he writes:

17 **Problem 1.** Is classical hypothesis testing at fixed level of
18 significance a “good” way to summarize the evidence in favor of or
 against hypotheses of the form described above?

19 Our answer is decidedly negative [...]

20 Leamer (1978), p. 89 (Harvey Decl. Ex. 22). A few pages later: “And the rule ‘set $\alpha = .05$ [the
21 95% level] regardless of sample size seems undesirable under close examination.” *Id.* at 98.

22 Similarly, the fact that Dr. Leamer reports measures of statistical uncertainty including
23 standard errors, t values, and indicators of statistical significance, does not mean he has used or
24 endorsed point null hypothesis testing. As he explained at length in his deposition, in a passage
25 that the Defendants ignore:

26 A. They are the standard things that come rolling out of
27 computer packages. But that table that you’re referring to is a
28 whole bunch of numbers. Every one of those numbers has to be
 interpreted with some wisdom.

1 So the fact that a coefficient is statistically significant, that
2 means something to me, and it's appropriate to have that in the
printout.

3 Q. So I think the answer to my question is yes, you did, in
4 various aspects of your work in this case, rely on statistical
significance, correct?

5 A. But let's make sure that we get exactly clear what we
mean by that.

6 One is it determines whether a coefficient is exactly zero or
not. That's a hypothesis testing.

7 To me, the word "statistically significance" [sic] isn't about
8 hypothesis testing. It's about the measurability of an effect. A
highly significant -- statistically significant coefficient doesn't
9 mean that variable is important, which is what you and I think what
the word "significant" must mean. It means its effect is measurable.

10 I'll use that word always to signify that comment -- that
interpretation, not to suggest hypothesis testing.

11 Leamer Dep. 1243:4-1244:24.

12 Defendants continually miss the point that statistical significance means more than just
13 point null hypothesis testing. For example, Dr. Leamer explains that the p-value can be used to
14 understand that the probability of positive damages is 89%. Leamer Rebuttal ¶ 89. In his
15 "sharing" regressions, Dr. Leamer used the relative statistical significance of the sharing variables,
16 compared to external variables, as one criterion for concluding that a title-based pay structure
17 links together the compensation of Defendants' workforces. Leamer III ¶¶ 34-42. He also
18 included in the sharing regressions only titles with six or more years of data—excluding "data
19 sets [that] are too small" in favor of ones with more explanatory power. *Id.* ¶ 20. But those kinds
20 of modeling choices have nothing to do with point null hypothesis testing; rather they reflect a
21 considered, and correct, application of the concept of statistical significance.

22 C. **Notwithstanding the Limited Utility of Point Null Hypothesis Testing,**
23 **Defendants Conduct an Invalid Test**

24 Besides applying it untethered to the specific data here, Dr. Stiroh has gone about
25 hypothesis testing in the wrong way. In his Rebuttal Report, Professor Leamer explains the
26 accepted way to choose a significance level to conduct null hypothesis testing, if one chooses to
27 conduct such a test. Leamer Rebuttal ¶¶ 83-90. The right significance level depends on
28 balancing the risks and costs of Type I and Type II errors. Type I error would be finding impact
and damages when none existed. Type II error would be *rejecting* impact and damages when

1 they in fact happened. Using a statistical significance level of 95% effectively sets the Type I
 2 error rate at 5%—meaning that the regression would only incorrectly find impact and damages if
 3 there were no impact 5% of the time (1 in 20). However, the risk of Type II error—*failing* to find
 4 impact and damages that happened—is much higher. For example, if true undercompensation
 5 were 1%, the regression would fail to find it *95% of the time*, if one imposes Dr. Stiroh’s
 6 requirements. *Id.* ¶ 85. If true undercompensation were 10%, the regression would still fail to
 7 find positive impact 40% of the time. *Id.* This is why, Dr. Leamer explains, a 95% significance
 8 level “is seriously biased in favor of the Defendants,” amounting in effect to a presumption that
 9 their violation of the law did not impact compensation. *Id.*

10 Dr. Leamer therefore recommends a balanced significance level of 50%, if one chooses to
 11 perform point null hypothesis testing (which he does not). As Dr. Leamer explains,

12 This has the appeal of putting the hypotheses of “no damages” and
 13 “small damages” on an equal footing – both with a 50% probability
 14 of making an error. With this significance level there is a relatively
 small 6% chance of deciding in the favor [of] the defense if actual
 damages were 10%. This seems to me to be the correct approach.

15 *Id.* ¶ 86. With this correct criterion, the regression result “rejects” the null hypothesis in the way
 16 that Dr. Stiroh and the Defendants want it to (it has a p value of .21548, making it “statistically
 17 significant” to a level of 79%). *Id.* ¶ 87; Stiroh Report Ex. V.2.

18 With once again no citations to anything, Defendants dismiss this approach as “contrived”
 19 and “junk science.” Dkt. 570 at p. 9. To the contrary, considering Type II errors is a
 20 longstanding requirement of point null hypothesis testing, one which Dr. Stiroh has failed to
 21 follow. On this point, the *Encyclopedia* can speak for itself:

22 A fallacious argument is that power and error of the second kind
 23 (accepting the null hypothesis when it is false) need not be of
 24 concern, since the null hypothesis is never really accepted but is
 25 just not rejected. This is **arrant playing with words**, since a
 significance test is **fatuous** unless there is a question with at least
 two possible answers in the background. Hence, both kinds of
 probabilities of wrong answers are important to consider.

26 Kruskal, Wm., “Significance, Tests of,” INT’L ENCYCLOPEDIA OF STATISTICS (1978), at 951
 27 (emphasis added) (Harvey Decl. Ex. 20). Defendants are incorrect that choosing a significance
 28 level of 0.5 amounts to “flipping a coin” over “billions of dollars in damages.” Dkt. 570 at 8. As

1 Dr. Leamer explained at his deposition it means the regression at a level of 50% significance
 2 might have very little power to determine the question of a *penny* of effect. It correctly allows,
 3 however, that if damages are much larger than a penny—as they are here—then the regression
 4 has sufficient power to find impact. Leamer Dep. 1255:24-1256:3 (“So you’re absolutely right,
 5 that for tiny, tiny damages, it says that you might as well flip the coin. And that gives you –
 6 having done that, then you have more power at a higher level of damages. So that if the damages
 7 are 10 percent, that means that you only have a 10 percent chance of making an error.”).

8 Defendants contradictorily say that this explanation is made for litigation, Dkt. 570 at 9, but then
 9 cite Dr. Leamer’s 1978 book *Specification Searches* to explain it, Dkt. 570 at 8. Either way they
 10 miss the point: here flipping a coin does not refer to randomness, it means not having a bias one
 11 way or the other about the desirability of committing an error in favor of either answer.

12 Dr. Stiroh claims, without citation to any authority, that Dr. Leamer’s approach “is
 13 contrary to standard practice for published and peer-reviewed economic literature.” Stiroh Decl.,
 14 Dkt. 574 ¶ 6. Dr. Stiroh has no basis for this judgment, never having held a single academic
 15 appointment and never having published any “peer-reviewed economic literature.” Dr. Stiroh’s
 16 scant publications have all been submitted, in full, in conjunction with this brief. Harvey Decl. at
 17 Exs. 207-211. They are marketing pieces written with and for lawyers for advocacy work. The
 18 “books” to which she has contributed “chapters” are published by NERA, her employer, and
 19 given away free to lawyers in order to drum up business. Stiroh Dep. 31:25-32:24 (“They have a
 20 marketing purpose and I think a part of our goal is to provide an education purpose.”). These
 21 marketing pieces are written “in such a way that it would be understandable to someone without a
 22 degree in statistics.” Stiroh Dep. 34:4-6. In contrast, Dr. Leamer has written 12 books on
 23 economics and econometrics as well as dozens of articles. Leamer Rebuttal, Exhibit 1 (C.V.).
 24 This of course includes *Specification Searches*, which has an entire chapter on the subject of
 25 hypothesis testing, submitted herewith. Harvey Decl. Ex. 22.

26 **II. Dr. Leamer’s Model Properly Measures the Harm Caused by Defendants**

27 Defendants claim that “Dr. Leamer’s model cannot distinguish between the alleged effect
 28 of the challenged DNCC agreements and other restrictions on cold calling that were the product

1 of concededly lawful agreements or unilateral policies during the class period.” Dkt. 570 at 11.
 2 They identify no-recruiting agreements between Intel and Apple, and Intel and Pixar; they also
 3 identify two companies as to which Google “adopted DNCC policies effective January 20, 2006.”
 4 *Id.* Because the regression supposedly includes damages arising from these “lawful”
 5 arrangements, it must be excluded. *Id.* Defendants’ argument proceeds from several
 6 fundamentally wrong premises, and must be rejected.

7 First, although Defendants claim Dr. Leamer’s “own admissions” demonstrate this
 8 purported problem, they quote his testimony selectively and misleadingly. Dr. Leamer has more
 9 than once carefully explained the circumstances under which this issue could arise. The
 10 supposedly “lawful” conduct would have to be of the same effect, scope, terms, and duration as
 11 the “unlawful” conduct. Moreover, there would have to be no comparable “lawful” agreements
 12 or “unilateral” policies before or after the Class Period; otherwise, the presence of that lawful
 13 conduct would be controlled for by the benchmark periods. (In other words, if there is “lawful”
 14 conduct suppressing compensation before, during and after the Class Period, then the regression
 15 will control for it in measuring damages.).

16 A. So if the hypothetical that you’re imagining is magically
 17 there was one other agreement that started on exactly that day and
 18 ended that day, and absent other agreements, legal or otherwise,
 that were impacting information flow, then yes, that’s going to be
 absorbed by the conduct variable.

19 Leamer Dep. 1025:22-1026:2. Dr. Stiroh agrees that this purported problem only arises if the
 20 lawful conduct “spans the entirety of the [class] period”. Stiroh Dep. 57:19. She concedes the
 21 problem is “hypothetical,” and could not identify any specific “lawful” conduct that would make
 22 it “concrete.” Stiroh Dep. 61:23-62:12 (“To the extent that no agreements exist between these
 23 parties that overlaps with the time period that is in the damage period that Dr. Leamer analyzes,
 24 then it is a hypothetical issue... But as I sit here today, it’s not something that I’ve looked at for
 25 some time, so I just don’t have the information at my fingertips to be able to give you a more
 26 concrete answer.”).

27 In fact, Intel’s limited “agreements” and Google’s “policies” started well into the Class
 28 Period, not on “exactly the same day.” Compare Dkt. 570 at 11 (“Intel had...agreements with

Apple and Pixar that began during the class period...Google adopted DNCC policies...effective January 20, 2006.”). Deborah Conrad testified that the Intel/Apple agreement began in 2007. Brown Decl., Dkt. 573, Ex. 11 82:19-22. She also testified it was limited to “key employees” collaborating on integrating the Intel chip into Mac computers. *Id.* 110:2-13; see *id.* 82:8-17. She never testified about when it ended; there is no support for the assertion that it “ended contemporaneously with” the class period. Dkt. 570 at 11. According to Defendants, the Intel/Pixar agreement was similarly limited: “it was focused on a specific team, the RenderMan team.” Brown Decl. Ex. 12, 80:8-9. The agreement commenced in 2008. *Id.* at 151:18-158:22. Defendants submit no evidence about when it ended.

Because Defendants do not point to any “lawful” or “unilateral” conduct⁴ that could possibly make their “hypothetical” problem “concrete,” this may not form even a possible basis for excluding Professor Leamer’s damages analysis.⁵

III. Dr. Leamer’s Model Properly Accounts for New Hires

Defendants next claim that Plaintiffs’ damages model wrongly uses a “total new hires” variable that is the sum of all new hires by all Defendants, rather than utilizing various disaggregated hiring variables for each Defendant. Dkt. 580 at 12-14. Defendants argue that in

⁴ Plaintiffs do not concede any such conduct would be lawful or unilateral. For instance, the “unilateral” policies identified by Google are found on a document that begins with the caption “Special Agreement Hiring Policy” and continues with “The following companies have special agreements with Google[.]” Brown Decl. Ex. 13.

⁵ None of the cases Defendants rely upon requires plaintiffs to desegregate damages with the surgical precision that Defendants demand; in each case the court’s decision depended on more fundamental shortcomings in the testimony. Defendants invoke *Comcast*, but in that case the plaintiffs’ own expert claimed that certain conduct caused harm, which later could not be proven on a class-wide basis. *Image Technical Services* concerned monopolization of two separate markets; the plaintiffs failed to segregate their damages in the two markets (sales and parts); the court found one market had not been monopolized. *Image Technical Services v. Eastman Kodak Co.*, 125 F.3d 1195, 1223-24 (9th Cir. 1997). See *In re Brand Name Prescription Drugs Antitrust Litig.* 186 F.3d 781, 786 (7th Cir. 1999) (affirming exclusion of expert testimony as *irrelevant*; his conclusion, that manufacturers of brand name prescription drugs engage in price discrimination, was already established); *Concord Boat Corp. v. Brunswick Corp.*, 207 F.3d 1039, 1055 (8th Cir. 2000) (rejecting expert’s model where it did not reflect the “economic reality” of the product market or account for specific market events); *Blue Cross & Blue Shield United v. Marshfield Clinic*, 152 F.3d 588, 593 (7th Cir. 1998) (finding the expert’s explanation for the difference in price for medical services unreliable because it contained “no correction for any other factor except differences in the treatment mix”); see also *In re REMEC Inc. Sec. Litig.*, 702 F. Supp. 2d 1202, 1273 (S.D. Cal. 2010) (expert failed to account for “industry-specific news . . . market-specific news . . . or other measurable macroeconomic variables”).

Dr. Leamer's model there is a "wrong" negative coefficient for the total new hires variable, indicating that as the number of new hires increases, total compensation decreases. *Id.* at 14. They also contend that the regression is unduly "sensitive" to changing the start date of Intel's participation in the conspiracy, from the actual date to an imaginary date. *Id.* Each of these arguments lacks merit and provides not even a basis to question the estimate, let alone exclude it.

First, Dr. Stiroh's decision to "split" the total new hires variable is a classic defense stratagem—remove the variable with the highest t-value—rather than an approach required by science. Dr. Leamer himself proved in a 1975 paper that "if you want to wreak havoc on the coefficients, omit the variable with the largest absolute t-value." Leamer Rebuttal ¶ 115 (citing Edward Leamer, "A Result on the Sign of Restricted Least Squares Estimates," *Journal of Econometrics*, 3 (1975), 387-390). Here, "it is the log of total number of new hires that has the largest absolute t-value other than the persistence effects captured by the lagged total compensation variables." *Id.* Thus, it is predictable that Dr. Stiroh would "focu[s] her attention on this variable, estimating eight different regressions removing this variable and replacing it each time with one of three different sets of variables." *Id.* Dr. Leamer uses the "total new hires" variable as a "macro-factor to control for the overall demand for labor by all defendants." *Id.* at 131. Dr. Stiroh, however, *removes* this variable altogether and replaces it with two new variables, one of which she additionally interacts with the conduct variable, "thus materially changing the way the conduct effect is computed." *Id.* ¶ 130. Predictably, this results in wild outcomes such as "overcompensation by Defendants during the class period." Dkt. 570 at 13.

Dr. Stiroh *assumes* her formulation is preferable, but the data show that it is not. Rather than making assumptions, Dr. Leamer has run the regression with both his "total new hires" variable and Dr. Stiroh's "split" new hires variables. Leamer Rebuttal ¶ 131. The results are striking:

28. Log(Total Number of DNOC New Hires)	-0.0167	0.0410	-0.4059
29. Log(Total Number of non-DNOC New Hires)	-0.0359	0.0653	-0.5491
30. Log(Total Number of New Hires)	-0.2784 ***	0.0831	-3.3508

Id. p. 72. Professor Leamer's preferred "total new hires" variable has the largest coefficient and also by far the largest t-value—the measure of statistical significance. In fact, the "total new

1 hires” variable shows statistical significance at 99% levels; whereas Dr. Stiroh’s variables lack
 2 statistical significance, i.e. a measurable effect on compensation. This confirms Dr. Stiroh’s
 3 results-driven approach: as explained in Dr. Leamer’s 1975 paper, this is a disguised way of
 4 disrupting the estimate by “omit[ting] the variable with the largest absolute t-value,” not replacing
 5 it with something better. Dr. Stiroh has no response to this in her declaration.

6 Second, Dr. Stiroh’s justification for the attack—that the negative sign on the total new
 7 hires coefficient indicates a problem with the regression—has no support. The sign on this
 8 coefficient has been negative for over a year, since Dr. Leamer first proposed this model in
 9 connection with class certification.

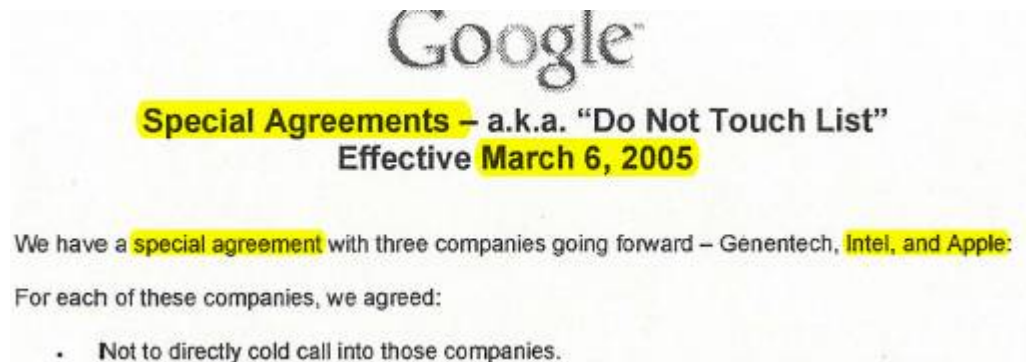
10 27. Log(Number of New Hires in the Firm/Number of Employees(-1))	0.0154 ***	0.0009	16.6057
11 28. Log(Total Number of New Hires)	-0.2485 ***	0.0021	-116.9807
12 29. Log(Firm Revenue Per Employee/CPI) (-1)	-0.1070 ***	0.0035	-30.1447

13 Dkt. 190, Leamer I (10/1/2012), p. 66. Dr. Murphy never criticized this, presumably because he
 14 knows, as Dr. Leamer has explained in depth, that the Plaintiffs’ model is a dynamic regression
 15 model that requires the examination of several variables to explain an effect. Hence, one cannot
 16 assume that a negative coefficient for the total number of new hires is a “wrong sign” because “of
 17 the complexity of the question that the coefficient answers.” Leamer Dep. 1008:19-22. The total
 18 new hires variable “compete[s] with all the other variables in the equation to explain total
 19 compensation.” Leamer Rebuttal ¶ 72. Assuming that a negative coefficient must be a
 “counterintuitive” result fails to understand the model. *See* Leamer Dep. at 941.

20 Dr. Stiroh’s judgment about the true sign of the co-efficient presumes that she knows
 21 *better than the data* what the sign ought to be. Leamer Rebuttal ¶ 116. As explained by Dr.
 22 Leamer, the data are what they are: the hundreds of thousands of data points here tell the analyst
 23 that at these firms, increases in new hires tend to be negatively correlated with increased
 24 compensation in the regression once other effects are accounted for. *Id.* ¶ 118. This requires the
 25 analyst either to find a plausible explanation or to find a variable that, when added, “corrects” the
 26 sign (i.e., provides a substitute explanation for the apparent negative correlation). *Id.* ¶ 117.
 27 Dumping the important variable is not one of the options. Dr. Leamer has identified a plausible
 28 explanation, namely that periods of economic recovery will be typified by periods of ramped-up

1 hiring but persistent low wages, as employers bring back laid-off employees. *Id.* ¶ 118. Only
 2 later, as the labor market tightens, does upward pressure on wages occur. *Id.* If Dr. Stiroh
 3 doesn't care for the sign of the variable and the explanation, she needs to find the omitted variable,
 4 which she has not done.

5 Third, Defendants and Dr. Stiroh describe the total new hires variable and the damages
 6 result as unduly "sensitive" to Intel's data. Dkt. 570, p. 14 ("The fact that the model is so
 7 sensitive to changes in Intel's hiring reveals a fundamental flaw"). However, their "proof" of
 8 this—moving the start date of Intel's inclusion in the conspiracy to 2006—is senseless noise.
 9 Citing nothing, defendants say "evidence indicates that there was no agreement between Google
 10 and Intel concerning cold calling until 2006." Dkt. 570, p. 14. Plaintiffs beg to differ:



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 17 Cisneros Decl. Ex. 1741, at GOOG-HIGH-TECH-00194870 (highlighting added). *See also*
 18 October 24, 2013 Order, Dkt. 531 at 29. Even if they did not depend on broad distortions of the
 19 record, Defendants' criticisms still would not be a basis to exclude Dr. Leamer's testimony.
 20 Debates about whether Intel's data "drive[s]" the new hires variable, or the correct interpretation
 21 of Defendants' new "Exhibit 114" (which disaggregates the variable) are prototypical matters
 22 going to weight, not admissibility. Dkt. 570 at 14. (Dr. Leamer disagrees with Defendants'
 23 interpretation of the chart. Leamer Dep. 1187:13-1190:25.) As set forth above Professor Leamer's
 24 regression employs standard statistical methodology and accounts for the necessary "major
 25 factors" driving compensation. *Bazemore*, 478 U.S. at 400. It is therefore admissible.

26 CONCLUSION

27 For the foregoing reasons, the motions regarding Dr. Leamer should be denied.
 28

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Respectfully Submitted,

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